an environmental data bank.

Another project that has received funding (from EPA) is the further development of the versatile semiconductor detector x-ray fluorescence spectrometry technique originated at LBL for trace-element analysis. Under Frederick S. Goulding, the laboratory will provide EPA with a working model of the spectrometer, study its application to monitoring particulate pollution in air and train EPA personnel in its use. The instrument is sensitive and rapid enough to be considered as a potential means of establishing national standards for particulate monitoring.

Other proposals in preparation or review include an experimental and theoretical study of the energy budget of Lake Tahoe, a study of the chemistry of atmospheric particulate matter by photoelectron spectroscopy, development of a lidar (laser-radar) system for remote sensing of gaseous atmospheric pollutants, development of a rock-boring (tunneling) technique using high-energy electron beams, development and biomedical evaluation of an ultra-trace analyzer of breath and skin respiration, studies of trace elements in marine animals and in human epidemiology, development of a rapid and extremely sensitive detector for mercury, cadmium and lead in biological and food materials, and a study of the chemical consequences of nitrogen oxides in the stratosphere. Like the environmental instrumentation survey, these and other proposals use available resources at LBL and the campus.

Necessarily, most of them also cut across conventional disciplinary lines. The Lake Tahoe study, for example, would combine agricultural engineering, limnology, physics and zoology; a proposal to analyze trace elements in marine life at Bodega Bay, California, would require the skills of a marine biologist, a chemist and an electronics engineer; development of the breath and skin respiration analyzer—a physicist, an electronics engineer and a chemist.

What is the future of environmental research programs such as LBL's? Hollander and Sessler view it as promising. They believe interdisciplinary research laboratories such as the AEC's national laboratories provide an ideal and unique marriage of basic science and technology for furthering fundamental knowledge of man's interaction with the environment. "We expect support to be increased at all levels as regulatory agencies become more aware of the need for expanding fundamental knowledge as the basis for constructive environmental control," says Hollander. "We believe our program and others like it will grow as environmental awareness grows."

NRC reviews research on amorphous semiconductors

Ever since they were brought into the public eye, largely through the efforts of Stanford R. Ovshinsky (see PHYSICS TODAY, January 1969, page 63) amorphous semiconductors have been the subject of an increasing amount of research. The National Materials Advisory Board of the National Research Council has recently published a report on the state of amorphous-semiconductor research entitled *Fundamentals of Amorphous Semiconductors.*

According to Henry Ehrenreich of Harvard, who headed the committee that prepared the report, the object of the report was "to ascertain what has been accomplished scientifically, what the problems are, and to provide some perspective which may be helpful in planning future investigations."

The committee decided to limit the report to those semiconductors that are of the greatest interest in either the fundamental or technological areas. They chose the elemental glasses, Se, Ge and Si and the chalcogenide mixtures As–S, As–Se, Te–Ge and Te–As–Si. The last three are known for their applications in xerography, memory and threshold switching respectively.

The report notes that there is enough yet to be done in the field of amorphous semiconductors to keep experimentalists and theorists busy for years to come. The committee made a number of recomendations in its report as to the areas that might be stressed in future research. As a guideline for ongoing research, the report suggests that "close collaboration between experimentalists and theorists is essential for further progress in the field." The report encourages experimentalists to choose work that will clarify the validity of various theories, and theorists to work in areas that may be subject to experimental verification. The committee suggested that coordinated experimental programs be set up where "all aspects of preparation, characterization and measurement are addressed, results correlated and cause and effect relationships pursued and understood."

Preparation is one of the major problems in amorphous semiconductor work because at present it is very difficult to prepare samples that are sufficiently reproducible for fundamental research. The report advises that a more widespread awareness of the methods of material preparation be developed "since the structure and properties of an amorphous material may depend intrinsically on the method of preparation." The committee suggested that publications should always include details of preparation and that efforts be made to distinguish between experimental properties that are characteristic of the actual material and those that may result from poor materials preparation.

The committee recommended that workers in the field of amorphous semiconductors try to collect more information about their physical properties. Such data, which are often crucial for the testing of models, are "quite sparse" for the chalcogenides. The report mentions in particular specific enthalpy and volume measurements. Precise density measurements are also needed, and the committee recommended improvement of x-ray techniques, use of neutron scattering studies and the application of scanning electron diffraction techniques to the structure of thin amorphous films. The generation of random network models, either by computer or manually, is also stressed in the report.

The committee recommended studies of radiation hardness in glassy semiconductors.

In the area of amorphous-semiconductor devices, the committee noted the importance of starting research intended to exploit the unique properties of these semiconductors. Also, work on differentiating the relative role of electronic and thermal switching mechanisms is of high priority, according to the NMAB committee.

Finally, in the area of funding and program level, the report urges that "a sizable effort of high-quality research regarding the physical, chemical and engineering properties of amorphous semiconductors be encouraged." —SMH

in brief

Nominations for the Fritz London award for outstanding contributions to low-temperature physics should be sent to Dean Ernest A. Lynton, Livingston College, Rutgers University, New Brunswick, N. J. 08903 by 17 March. The $1000 prize will be awarded at the Low-Temperature Conference in August.

The Directory of Physics and Astronomy Faculties 1971–72 is now available. It lists physics and astronomy faculties in the US, Canada, Mexico and Central America that offer college-level courses in physics or astronomy. The directory costs $5.00 if payment accompanies the order, $1.00 more for non-cash orders and may be ordered from AIP, 335 East 45th St, New York, N.Y. 10017.